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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 27

Application Number: 09/369,767
Filing Date: August 06, 1999
Appellant(s): NEUMANN, HARALD

Richard L. Mayer
For Appellant

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EXAMINER'S ANSWER

This is a supplemental examiner's answer in response to the remand from the Board mailed on 2-06-2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

Appellant's listed status of the claims is correct except for item 4. In paper no. 20, the examiner withdrew the rejection of claims 9 and 12 over Murase in view of Kato (see paragraph 7 of the examiner's Advisory Action). The corrected item 4 should read "Claims 1-8, 10, 11, 13 and 14 were rejected under 35 U.S.C 103(a) as unpatentable over U.S. Patent No. 5,413,683 to Murase et al in view of the Kato reference".

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The appellant's grouping of the claims in the brief is correct.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) ***Prior Art of Record***

4,909,922	Kato et al.	3-1990
4,629,549	Kojima et al.	12-1986
4,787,966	Nakajima et al.	11-1988
5,203,983	Ohyama et al.	4-1993
4,365,604	Sone	12-1982
4,400,260	Stahl et al.	8-1983
5,413,683	Murase et al.	5-1995

Logothetis et al. "High-Temperature Oxygen Sensors Based on Electrochemical Oxygen Pumping", Fundamentals and Applications of Chemical Sensors, ACS Symposium Series 309, 1986, pp. 136-154.

Liu et al, "Oxygen Sensors", Engineering Materials Handbook, vol. 4, Ceramics and Glasses, pp. 1131-1139.

(10) ***Grounds of Rejection***

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 7, 8, 10, 12-15, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stahl et al (4,400,260) in view of Ohyama, Kojima, Nakajima, or Sone and as evidenced by Logothetis.

Stahl discloses an electrochemical sensor which comprises a solid electrolyte element 25 with first and second electrodes (27, 29 respectively), a heating element 30, where the second electrode 29 is situated closer to the heating element that the first electrode (fig. 4 and 5). Stahl

also discloses connecting the second electrode 29 to a common element 33 with the negative lead of the heater. Although Stahl never discloses the common element to be at a ground potential, ground is a convenient potential available in the application of these electrochemical sensors (see discussion above with respect to Ohyama, Kojima, Nakajima, or Sone). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Ohyama, Kojima, Nakajima, or Sone with the sensor of Stahl because the prior art recognized the use of ground as a convenient lower potential for the heater. The use of ground as the lower potential for heater also simplifies circuit construction for the reasons set forth above (especially with respect to Sone). With respect to the polarization level of the first electrode, Stahl discloses operating the sensor in potentiometric mode (col.3, lines 11 and 12). In such an application, the polarization of the first electrode will be a function of the difference in oxygen levels in the gas being measured and in the reference passage. If the oxygen were greater in the measured portion than in the reference passage, the first electrode would be inherently negatively polarized (again, see discussion of EMF in Logothetis). Because the claim does not specify an operating condition where the measured gas concentration is less than the reference gas composition, Stahl would inherently meet the polarization limitation when the measured gas is of a greater concentration than the reference gas. The electrolyte of Stahl is zirconia (col. 3, line 13) and the heating element is placed on a protective coating (col. 5, lines 66-67). With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Stahl does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result

effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26).

With respect to the new limitations drawn to the use of an electrolyte tube, see col. 5, lines 16-26.

Claims 1-8, 10, 11, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase et al (5,413,683) in view of Kato (4,909,922).

Murase discloses an electrochemical sensor which comprises a solid electrolyte element 14 which includes a first electrode 32, a second electrode 30. Although not shown in the figures, Murase further discloses the use of a heating means for operating the sensor at elevated temperatures (col. 12, lines 32-35). Murase does not explicitly identify where the heating means would be located on the disclosed sensor, Kato teaches that it is conventional in the art to place the heater below the electrodes at a lower portion of the sensor (fig. 1-7). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Kato for the sensor Murase because placing the heater at the lower portion of the sensor has been identified as being a conventional location for sensor heaters. In this case, the second electrode 30 would be situated closer to the heating element than the first electrode. In

addition, Murase teaches coupling the second electrode to ground while negatively polarizing the first electrode by the application of a negative voltage with respect to ground. The negative voltage provided to the first electrode controls (powers) the measuring circuit (fig. 3 and associated discussion). The first and second electrodes have approximately the same sizes.

With respect to the choice of electrolyte, see col. 6, lines 14-15. With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Murase does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26). With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. Kato taught embedding the heater into an insulating member (see discussion above).

Claims 15-17, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase in view of Kato as applied to claim 1 above, and further in view of Liu et al.

The references set forth all the limitations, but did not explicitly teach the use of a tubular solid electrolyte element. Liu teaches, in an oxygen sensor review, that oxygen sensors can be

conventionally constructed using either planar elements (like those utilized by Kato and Murase) (fig. 1b) or a tubular configuration (fig. 1a) (see also fig. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Liu for the sensors of Kato and Murase because the art recognized that tubular elements are an alternative form of sensor construction and the substitution of one known means of constructing a sensor for another, when the results are not unexpected, requires only routine skill in the art. With respect to Kato and the claims of 16-18, the use of a power source was already rendered obvious by the teaching of Logothetis (see rejection for claims 2-4, and 21).

Claims 9 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 21 and 22 are allowed.

(11) Response to Argument

In this argument section, the examiner will not reiterate the arguments made in the original examiner's answer, but will instead concentrate solely on the issues raised by the Board on the remand mailed 2-06-2004. The Board in particular has raised three issues requiring clarification which the examiner paraphrases as: (1) how to interpret the claim language "negatively polarized"; (2) how to interpret figure 7 of Kato '922 in view of its disclosure; and (3) how to interpret fig. 4 and 5 of Stahl. The examiner will address each issue in the order presented.

The Board first requested clarification as to whether the limitation "negatively polarized" involves structural (wiring) or whether it would be negative only under certain operating conditions. The examiner's approach has been to give that claim limitation its broadest reasonable interpretation and interpret it as reading on both conditions. Applicant does not further specify any structural limitation until claim 2 where applicant specifically recites a negative operating voltage. Hence claim 2 would be restricted to the Board's former interpretation whereas claim 1 would not be so limited and would then read on an electrode that is capable of being negatively polarized under particular operating conditions (i.e. intended use). Logothetis was used to establish that the electrode in question would be negatively polarized under particular gas conditions. Furthermore, it would appear to the examiner that the applicant does not dispute the examiner's reading of that limitation either way, because they specifically challenged the examiner's conclusion with respect to Stahl as to whether its first electrode would go negatively polarized under the conditions the examiner established. See the first two paragraphs of page 12 of the Appeal Brief (paper 23). In short, they didn't argue that Stahl fails to teach any structural wiring that negatively polarizes the first electrode, but instead argued that the examiner was incorrect in his conclusion that the first electrode of Stahl would negatively polarize under the stated conditions. The examiner addressed that argument on the paragraph bridging pages 13 and 14 of the previous examiner's answer.

On the second issue, the Board argues that it doesn't appear that fig. 7 of Kato (which the examiner relied on) is supported by its own specification. In particular, Kato only appears to teach connecting the negative lead on the heater to the measuring electrode 22 (which is shown in fig. 3 and 6) and never explains the change shown in fig. 7 where the reference electrode is

now connected to the negative heater lead. In short, the Board suggests that the wiring shown in fig. 7 appears to be a typographical error. The examiner cannot explain why fig. 7 of Kato is enabled in view of Kato's own disclosure, and the examiner has withdrawn the issues related to the use of Kato as a primary teaching.

On the third issue, the Board requests clarification concerning Stahl and what the effect of current in the shield circuit formed by combining the leads of the heating element and the "measuring" and "shield" electrode. The Board further urges that is not apparent that the circuit forms an "oxygen pump" which can't be used in determining a polarity. The examiner is unsure what the Board is alluding to. Stahl never mentions anything about an oxygen pump or any concern about current from the shield circuit. In fact, the electrode and circuit arrangement of Stahl is largely analogous to the instant invention admitted prior art of fig. 1. In particular, the measuring electrode is effectively coupled to the same potential source as the negative lead of the heater source. Compare the instant invention fig. 1 (where the measuring electrode and negative heater lead are both grounded) with fig. 5 of Stahl (in view of the secondary teachings that teach grounding the negative heater lead). The reason Stahl, unlike the prior art, renders obvious a number of the claims is because Stahl teaches placing the heater closer to the measuring electrode than the reference electrode (see fig. 4). It almost appears to the examiner that the Board is alluding to the operation of Kato, which did discuss an oxygen pump and current flow from the heating element, in its request for clarification on Stahl. The examiner questions the relevancy of the operation of Kato for understanding Stahl. In particular, Kato was drawn to a device that was constructed in such a way that allowed current to leak through its insulating portions so as to get oxygen pumping (col. 3, lines 3-11). There doesn't appear to be

any indication that Stahl desires or allows current to leak through its insulating members 31 or 32 because Stahl is silent on oxygen pumping. Moreover, even if there was a small amount of undesired leak current, that would not change whether electrode 27 of Stahl would float positive or negative in view oxygen level differences between electrodes 27 and 29. In particular, even though Kato allows a small leak current, Kato still teaches that there are electromotive force differences between its two electrodes and those force differences are due to the oxygen levels of the measurement gas (col. 4, lines 18-22). Hence even in the event of undesired oxygen pumping, there still exists conditions when the ungrounded electrode would float either positive or negative in response to oxygen gas concentration of the measurement gas. If the ungrounded electrode were not able to float positive or negative in response to oxygen changes, then both Kato and Stahl would be inoperable as gas sensors.

For these reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

K.K.O.

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